diodes for rectifying the AC voltage of the armature winding 3 to DC voltage to have the reverse breakdown characteristics in order to restrict generation of high voltage pulse when a load is cut off. The output of the full-wave rectifier 4 is connected to each electric load 21 of a battery 2 and a vehicle.

The output of the alternator 1 changes depending on the number of rotations of engine and power feeding to the field winding 5. The field current flowing into the field winding 5 is controlled with the voltage regulator 6.

When a key switch 7 connected to the battery 2 is turned on, supply of the reference voltage Vcc of the voltage regulator 6, and bias voltage required for operation of each circuit may be started.

The voltage regulator 6 is formed with an output voltage control circuit 77, and a field current control circuit 86. The output voltage control circuit 77 comprises a high frequency noise filter circuit 64, resistors 79, 80, 81, voltage comparator 65, a high voltage pulse detecting circuit 83, an AND gate 69, and a transistor drive circuit 85.

The high frequency noise filter circuit 64 eliminates unwanted high frequency noise element to protect the voltage control operation from the ripple superimposed on an output voltage of the armature winding 3 and from the switching noise. A voltage signal having passed the high frequency noise filter circuit 64 is then inputted to the voltage comparator 65, and high voltage pulse detecting circuit 83.

The voltage comparator 65 compares two terminal voltages,

one of which is the output voltage of the high frequency noise filter circuit 64 and the other of which is the regulated voltage Vreg divided from the reference voltage Vcc with resistors 79 to 81. When a voltage higher than the regulated voltage Vreg is applied to the negative terminal, the output of the voltage comparator 65 becomes low level. When a voltage lower than the regulated voltage Vreg is applied, on the contrary, the output of the voltage comparator 65 becomes high level.

When the high voltage pulse detecting circuit 83, to which an output voltage of the high frequency noise filter circuit 64, and the reference voltage V3 divided from the reference voltage Vcc, with the resistors 79 to 81 are applied, detects the high voltage pulse based on two kinds of input voltages, this circuit executes the predetermined signal process and thereafter provides an output of the low level signal for the predetermined period. Moreover, if a high voltage pulse is not detected, the high voltage pulse detecting circuit 83 provides an output of high level.

The AND gate 69, to which respective output signals of the voltage comparator 65 and high voltage pulse detecting circuit 83 are applied, provides an output of the high level when these input signals are in the high level and also provides an output of the low level in other cases. The transistor drive circuit 85 executes the on/off control of the power transistor 61 within the field current control circuit 86 depending on the voltage level of input signal.

The field current control circuit 86 comprises a power

transistor 61 and a flywheel diode 62 to control a field current flowing into the field winding 5. The power transistor 61 turns on when an output terminal of the transistor drive circuit 85 is connected to the gate of the power transistor and the output of the transistor drive circuit 85 is in the high level. In this timing, the current flowing into the field winding 5 increases. The flywheel diode 62 is connected in parallel with the field winding 5 to flywheel the field current when the power feeding to the field winding 5 is controlled to OFF state.

Fig. 9 shows the high voltage pulse detecting circuit 83. The high voltage pulse detecting circuit 83 comprises a high voltage pulse detecting section 160, a discriminating section 170, and an output control section 180. The high voltage pulse detecting section 160 is structured with a voltage comparator 66. The discriminating section 170 is structured with a timer circuit 171, AND gates 172, 174, a pulse counting circuit 173 and a pulse duration measuring circuit 175. The output control section 180 is structured with a timer circuit 181 and an output control circuit 182. The field current control circuit 86 corresponds to the field current control means, while the output voltage control circuit 77 to the output voltage control means, the high voltage pulse detecting section 160 to the high voltage pulse detecting means, the discriminating section 170 to the discriminating means and the output control section 180 to the output control means, respectively. The timer circuit 171, AND gate 172 and pulse counting circuit 173 correspond to the pulse counting means, while the timer circuit 171 to the timer means